

What is claimed is:

1. A combined four way and seven way connector assembly for communicating a towing vehicle's electrical system with either a four way or seven way input harness associated with a towed vehicle, the towing vehicle further including a wire harness supplying an output of the electrical system, said connector assembly comprising:

a housing containing a plurality of electrical circuits which communicate with a first plurality of terminals defining a four way connector and a second plurality of terminals defining a seven way connector, each of said first and second pluralities of terminals defining an input plug in said housing and which is accessible by the towed vehicle input harness;

connecting means for electrically communicating the towing vehicle's electrical supply wire harness to said plurality of circuits; and

a monitoring circuit, in operative communication with said four way and seven way connectors, and operative, in response to determining the existence of an attached vehicle input harness, to selectively enable and disable power to said assembly.

2. The connector assembly as described in claim 1, said monitoring circuit further comprising a magnetically switching transistor mounted to said housing and in proximity to an access cover pivotally associated with at least one of said seven way and four way connectors, a magnet attaching to a lip of said cover and, upon pivotally opening said cover, said magnet displacing a distance from said transistor to convert said transistor to an enabled/powered state.

3. The connector assembly as described in claim 2, further comprising said access cover overlaying said seven way connector.

4. The connector assembly as described in claim 2, further comprising said access cover overlaying both said four way and said seven way connectors.

5. The connector assembly as described in claim 1, further comprising at least one back up assist sensor mounted to a rearward facing surface of said housing, said sensors being operatively connected to a processor and, responsive to the detection of an object in the path of a vehicle engaged in reverse gear, signaling an alarm to a driver of the vehicle.

6. The connector assembly as described in claim 1, said plurality of electrical circuits further comprising a printed circuit board.

7. The connector assembly as described in claim 6, said first plurality of terminals including a first plurality of metal frets and said second plurality of terminals including a second plurality of metal frets, an insulating layer interposing between said frets and said circuit board and each of said frets further including interiorly configured receiving holes and extending solder tails which mate and are soldered to said circuit board.

8. The connector assembly as described in claim 1, said plurality of electrical circuits further comprising a common subplurality of four circuits associated with said four way connector, an additional plurality of three circuits combining with said subplurality of four circuits and associated with said seven way connector.

9. The connector assembly as described in claim 6, said circuit board further comprising a plurality of electrical components selected from the group including fuses and mechanical relays, said relays providing power switching functions to said connector assembly.

10. The connector assembly as described in claim 6, further comprising said first and second pluralities of terminals integrally being formed with and extending from a selected face of said printed circuit board.

11. The connector assembly as described in claim 6, further comprising said printed circuit board being encapsulated in a potting material.

12. The connector assembly as described in claim 11, said housing further comprising a first body portion having a top and four interconnected sides, at least one access cover associating with an exterior face of said body portion and being actuable to reveal said first and second pluralities of terminals, a second insulated and backing portion matingly assembling against and open rear of said first body portion and enclosing said circuit board therebetween.

13. The connector assembly as described in claim 12, said connecting means further comprising an annular and inwardly facing wall defined in said second backing portion and which defines an aperture for receiving a plurality of input wires associated with the vehicle electrical supply.

14. The connector assembly as described in claim 1, said plurality of electrical circuits further comprising an insert molded component integrating metal stampings and a plasticized insulator.

15. The connector assembly as described in claim 14, further comprising a plurality of electrical components selected from the group including fuses and mechanical relays and which are assembled upon said insert molded component.

16. The connector assembly as described in claim 15, said housing further comprising a first covering portion having a substantially planar top and four interconnected sides, a second assembly portion including interiorly configured apertures for receiving an insert component defining said first and second pluralities of terminals.

17. The connector assembly as described in claim 16, at least one access cover associating with a face of said second assembly portion opposite said first covering portion, said access cover being actuable to reveal said first and second pluralities of terminals, said second assembly portion securing said first and second pluralities of terminals.

18. The connector assembly as described in claim 17, said connecting means further comprising a plurality of input wires associated with said vehicle electrical supply harness extending through an aperture configured in a selected one of said four interconnecting sides of said first covering portion, extending ends of said input wires engaging selected locations of said insert molded component.

19. The connector assembly as described in claim 1, said plurality of electrical circuits further comprising a flexible circuit having a first face and a second opposite face and which integrates an electrically conductive foil and a plastic insulating laminate.

20. The connector assembly as described in claim 19, said flexible circuit being configured in a desired fashion and so that said first face defines a first location to which are secured said first and second pluralities of terminals, additional pluralities of circuit protection components and relays being secured to at least one additional location of said flexible circuit defined along said first face.

21. The connector assembly as described in claim 20, said housing further comprising a body portion having a top and four interconnected sides enclosing said flexible circuit, at least one access cover associating with an exterior face of said body portion and being actuatable to reveal said first and second pluralities of terminals.

22. The connector assembly as described in claim 21, said connecting means further comprising a plurality of input wires associated with said vehicle electrical supply harness and which engage selected locations along said second opposite face of said flexible circuit.

23. A combined four way and seven way connector assembly for communicating a towing vehicle's electrical system with either a four way or seven way input harness associated with a towed vehicle, the towing vehicle further including a wire harness supplying an output of the electrical system, said connector assembly comprising:

a three dimensional housing including a top and a plurality of interconnected sides;

a circuit board supporting a plurality of electrical circuits and which is contained within said housing;

a first plurality of terminals defining a four way connector and a second plurality of terminals defining a seven way connector, each of said first and second pluralities of terminals including metal frets and which communicate with a selected number of said plurality of circuits, said first and second pluralities of terminals defining first and second input plugs accessible through said housing by the towed vehicle input harness;

an integral input connector accessible through said housing and with said circuit board, said input connector electrically communicating the towing vehicle's electrical supply wire harness to said plurality of circuits; and

a monitoring circuit, in operative communication with said four way and seven way connectors, and operative, in response to determining the existence of an attached vehicle input harness, to selectively enable and disable power to said assembly.

24. A combined four way and seven way connector assembly for communicating a towing vehicle's electrical system with either a four way or seven way input harness associated with a towed vehicle, the towing vehicle further including a wire harness supplying an output of the electrical system, said connector assembly comprising:

a three dimensional housing including a top and a plurality of interconnected sides;

a substantially planar shaped component supporting a plurality of electrical circuits and which is contained within said housing;

a first plurality of terminals defining a four way connector and a second plurality of terminals defining a seven way connector, each of said first and second pluralities of terminals communicating with a selected number of said plurality of circuits associated with said planar shaped component, said first and second pluralities of terminals defining first and second input plugs accessible through said housing by the towed vehicle input harness;

connecting means including a plurality of input wires associated with the vehicle electrical supply and which are accessible through said housing and with said circuits contained within said planar shaped component, said input wires electrically communicating the towing vehicle's electrical supply wire harness to said plurality of circuits; and



a monitoring circuit incorporating a magnet and a spatially displacing magnetically switching transistor, in operative communication with said four way and seven way connectors, and operative, in response to determining the existence of an attached vehicle input harness, to selectively enable and disable power to said assembly.